REMARKS

The Applicant respectfully requests reconsideration in view of the foregoing amendments and following remarks.

Claims 1-23 are pending. In the Office action dated September 21, 2004 ["Office action"], claim 1 was rejected as being unpatentable over U.S. Patent No. 4,051,470 to Esteban et al. ["Esteban"]. Claims 2-3, 7-10, 17-19, and 21-23 were rejected as being unpatentable over U.S. Patent No. 6,029,126 to Malvar ["Malvar"]. Claims 4 and 11-13 were rejected as being unpatentable over Malvar in view of Esteban. Claims 5, 6, 14, 16, and 20 were rejected as being unpatentable over Malvar in view of U.S. Patent No. 5,835,149 to Astle ["Astle"]. Finally, claim 15 was rejected as being unpatentable over Malvar in view of Astle and Esteban. The Applicant respectfully disagrees with the rejections of these claims.

I. Form 1449s for the IDSs filed July 23, 2001, and October 9, 2001.

The Applicant filed Information Disclosure Statements on July 23, 2001 (with a 1-page Form 1449) and October 9, 2001 (with a 1-page Form 1449). Please provide an initialed Form 1449s for these two IDSs.

II. Claim 1 should be allowable.

Claim 1 is directed to reducing the number of iterations of a quantization loop for a block of spectral audio data. A polynomial relates actual bit-rate to quantization threshold, and the initial coefficients for the polynomial are set for typical spectral audio data. A candidate quantization threshold is calculated for a block of spectral audio data based upon the polynomial. The block is quantized with the threshold and the bit-rate of output following compression of the quantized block is measured. If the measured bit-rate falls within a pre-determined range, the candidate threshold is designated as final quantization threshold. Otherwise, one or more coefficients of the polynomial are adjusted, a new candidate threshold is calculated for the block based upon the polynomial, the block is quantized with the new threshold, and so on. In this way, for example, one or more coefficients of the polynomial itself may be adjusted based upon measured output bit-rate given a candidate quantization threshold for a block, so as to improve calculation of the next candidate threshold for the block and thereby more quickly converge on the final quantization threshold for the block. In particular, claim 1 recites:

a) setting a polynomial that relates actual bit-rate to quantization threshold for spectral audio data in an actual bit-rate feedback, uniform, scalar quantizer, the initial coefficients for the polynomial set for typical spectral audio data;

...

e) if the measured bit-rate falls within a pre-determined range below a target bit-rate, designating the candidate quantization threshold as final quantization threshold;
else adjusting one or more coefficients of the polynomial and repeating b)-e).

Esteban does not teach or suggest the above-cited language of claim 1 for at least the following reasons. First, Esteban describes quantization of samples in the time domain. [Esteban, 1:46-48, 2:9-19, 2:65-68, 6:62-66.] Esteban does not involve quantizing spectral audio data, and is even further from teaching or suggesting the above-cited language of claim 1.

Second, Esteban describes relations between samples S*n*, a reference polynomial C*n*, a quantization step Q, a sequence F*n*, and error E. [Esteban, 2:9-35, 3:11-4:19.] Esteban does not adjust the polynomial C*n*, quantization step Q, or any other parameter depending on measured bit-rate of output. In fact, Esteban's focus on error E as a criterion for adjusting quantization step Q leads away from the above-cited language of claim 1.

Third, in Esteban, the polynomial C*n* approximates samples S*n* of the original signal. [*Id.*] The polynomial C*n* does not relate actual bit-rate to quantization threshold, as recited in claim 1.

Fourth, the Esteban process continues until C*n* varies only slightly [Esteban, 3:43-45] or for a fixed number of iterations [Esteban, 3:59-63]. Either way, Esteban leads away from checking if measured bit-rate falls within a range below a target bit-rate, as recited in claim 1.

Claim 1 should be allowable.

III. Claims 2, 3, and 7-10 should be allowable.

Claim 2, as amended, recites:

a) setting a model that relates actual bit-rate to uniform, scalar quantization threshold for a data type in an actual bit-rate feedback quantizer;

...

e) if the measured bit-rate is acceptable, designating the candidate quantization threshold as final quantization threshold for the block of input data;
else adjusting the model and repeating b) – e) with the model as adjusted.

Claim 8, as amended, recites:

estimating a quantization threshold based upon a heuristic model of actual bit-rate versus quantization threshold...; and

evaluating whether bit-rate of compressed output quantized by the estimated quantization threshold satisfies the acceptability criterion and if so, designating the estimated quantization threshold as final quantization threshold, and if not, adjusting the model and repeating the estimating and evaluating with the model as adjusted;

Malvar does not teach or suggest the above-cited language of claims 2 and 8, respectively. Malvar describes codec systems with various components. [Malvar, Abstract.] For a coder, these components include a multi-resolution transform processor, a weighting processor, a uniform quantizer, a masking threshold spectrum processor, and an entropy encoder. [*Id.*] The entropy encoder may use parametric modeling to improve the efficiency of entropy encoding. [Malvar, 5:10-12, 18:23-19:34.] The parametric modeling is not a model that relates actual bit-rate to uniform, scalar quantization threshold (claim 2) or a model of actual bit-rate versus quantization threshold (claim 8), and it leads away from the above-cited language of claims 2 and 8, respectively.

Malvar also describes spectral weighting, which may be used to shape quantization noise so that the quantization noise is less perceptually objectionable. [Malvar, 13:8-15:33.] The spectral weight values depend, for example, on transform coefficient values and weighting rules [*id*], not on measured actual bit-rate. The spectral weighting in Malvar leads away from the above-cited language of claims 2 and 8, respectively.

As for uniform quantization, Malvar describes a binary search for a quantization step size used in scalar quantization. [Malvar, 19:36-56.] For fixed rate applications, a quantization step size is iteratively adjusted until the bit-rate of the output matches the desired rate as closely as possible without exceeding it. [*Id.*] For example, the starting value of the quantization step size dt is set and the rate of output obtained with that dt is checked. [*Id.*] If the rate is above budget, then dt is set to dt + 16; otherwise, dt is set to dt - 16. [*Id.*] On successive iterations, dt is adjusted by ±8, ±4, ±2, and then ±1, respectively, before reaching a final dt. [*Id.*]

Malvar's binary search for a quantization step size, in general, involves iteratively adjusting quantization step size. [*Id.*] It does not involve adjusting a model that relates actual bit-rate to uniform scalar quantization threshold, where calculation of a candidate quantization threshold for a particular block is repeated based upon the model as adjusted (as recited in claim 2). It also does not involve adjusting a model of actual bit-rate versus quantization threshold, where estimation of a quantization threshold is repeated based upon the model as adjusted (as recited in claim 8). The specific example of a binary search in Malvar (i.e., adjustment to dt halved in each iteration, so as to converge on a final dt in a fixed number of iterations) further leads away from the above-cited

language of claims 2 and 8, respectively. Malvar does not teach or suggest the above-cited language of claims 2 and 8, respectively

In view of the foregoing comments, The Applicant will not belabor the merits of the separate patentability of claims 3, 7, 9, and 10. Claims 2, 3, and 7-10 should be allowable.

IV. Claims 17-19 and 21-23 should be allowable.

Claim 17 recites:

> a threshold estimator for estimating a quantization threshold based upon a model of actual bit-rate versus quantization threshold, wherein the threshold estimator adjusts the model responsive to a negative evaluation of an acceptability criterion for the quantization threshold;

Claim 22 recites:

> means for estimating a quantization threshold based upon a heuristic model of actual bit-rate as a function of quantization threshold, wherein the means for estimating adjusts one or more parameters of the model responsive to a negative evaluation of acceptability of the estimated quantization threshold;

Claim 23 recites:

> the threshold estimator for estimating a quantization threshold based upon a heuristic model of actual bit-rate versus quantization threshold, wherein the threshold estimator adjusts the model responsive to a negative evaluation of an acceptability criterion for the estimated quantization threshold;

Malvar describes entropy encoding that uses parametric modeling to improve efficiency. [Malvar, 5:10-12, 18:23-19:34.] The parametric modeling does not teach or suggest a model of actual bit-rate versus quantization threshold (claim 17, 23) or a model of actual bit-rate as a function of quantization threshold (claim 22).

Malvar also describes spectral weighting. [Malvar, 13:8-15:33.] The spectral weight values depend, for example, on transform coefficient values and weighting rules [*id*], not on measured actual bit-rate. The spectral weighting in Malvar leads away from the above-cited language of claims 17, 22, and 23, respectively.

Malvar's binary search for a quantization step size, in general, involves iteratively adjusting quantization step size. [*Id.*] It does not involve adjusting a model of actual bit-rate versus quantization threshold (claim 17, 23) or adjusting one or more parameters of a model of actual bit-rate as a function of quantization threshold (claim 22). The specific example of a binary search in

Malvar (i.e., adjustment to dt halved in each iteration, so as to converge on a final dt in a fixed number of iterations) further leads away from the above-cited language of claims 17, 22, and 23, respectively. Malvar does not teach or suggest the above-cited language of claims 17, 22, and 23, respectively

In view of the foregoing comments, The Applicant will not belabor the merits of the separate patentability of claims 18, 19, and 21. Claims 17-19 and 21-23 should be allowable.

V. Claims 4 and 11-13 should be allowable.

Claim 4 depends on claim 2 and includes all language from claim 2. Each of claims 11-13 depends on claim 8 and includes all language from claim 8. Malvar does not teach or suggest the above-cited language of claims 2 and 8, respectively (see section III). Esteban also does not teach or suggest the above-cited language of claims 2 and 8, respectively. Esteban's focus on error E as a criterion for adjusting quantization step Q leads away from the above-cited language of claims 2 and 8, respectively. Moreover, the reference polynomial C*n* in Esteban is not a model that relates actual bit-rate to uniform, scalar quantization threshold (as in claim 2) or a model of actual bit-rate versus quantization threshold (as in claim 8). Finally, Esteban, 3:43-45 and 3:59-63 lead away from checking "if the measured bit-rate is acceptable" (claim 2) and "evaluating whether bit-rate ... satisfies the acceptability criterion" (claim 8).

The Examiner acknowledges that Malvar and Esteban do not disclose at least some of the additional language recited by claims 4 and 13 [Office action, page 9]. However, the Examiner then:

> takes Official Notice of the fact that these equations are well known obvious variants in the audio signal processing with compression art for their use in quantizing. To substitute any of the specific equations for Esteban's polynomials (column 2, lines 16-29) would have been an obvious functional equivalent.

[*Id.*] The Applicant disagrees. The equations of claims 4 and 13 are not "well known obvious variants in the audio signal processing with compression art for their use in quantizing" (as the Examiner asserts); rather, these equations are part of the subject matter invented by the Applicant. The Applicant respectfully requests that the Examiner provide supporting documentary evidence for the position the Examiner has taken by Official Notice as to these equations. Nor would it have been "an obvious functional equivalent" to substitute the equations of claims 4 and 13 into Esteban, 2:16-19 (as the Examiner asserts). Among other reasons, the equations in question use different

parameters (e.g., error E and reference polynomial Cn in Esteban; coefficients and bit-rate in claims 4 and 11-13). Claims 4 and 11-13 should be allowable.

VI. Claims 5, 6, 14, 16, and 20 should be allowable.

Each of claims 5 and 6 depends on claim 2 and includes all language from claim 2. Each of claims 14 and 16 depends on claim 8 and includes all language from claim 8. Malvar does not teach or suggest the above-cited language of claims 2 and 8, respectively (see section III). Claim 20 depends on claim 17 and includes all language from claim 17. Malvar also does not teach or suggest the above-cited language of claim 17 (see section IV). Astle also does not teach or suggest the above-cited language of claims 2, 8, and 17, respectively. Astle describes adjusting bit rate by varying quantization levels to be applied to DCT coefficients. [Astle, 11:33-57.] The bits used to encode one picture or buffer fullness values can affect the quantization level to be applied to the next picture. [*Id.*] Setting a quantization level for a next picture based on a current state (as in Astle) leads away from the above-cited language of claims 2, 8, and 17, respectively.

In view of the foregoing comments, The Applicant will not belabor the merits of the separate patentability of claims 5, 6, 14, 16, and 20. Claims 5, 6, 14, 16, and 20 should be allowable.

VII. Claim 15 should be allowable.

Claim 15 depends on claim 8 and includes all language from claim 8. Malvar does not teach or suggest the above-cited language of claim 8 (see section III). Astle also does not teach or suggest the above-cited language of claim 8 (see section VI). Finally, Esteban does not teach or suggest the above-cited language of claim 8 (see section V). The Applicant will not belabor the merits of the separate patentability of claim 15. Claim 15 should be allowable.

CONCLUSION

Claims 1-23 should be allowable. Such action is respectfully requested.

Respectfully submitted,

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